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13 March 1961

MEMORANDUM FOR: THE RECORD

SUBJECT : Beacon Test Program

**I. INTRODUCTION:**

1. The HRT-1 (Wesponder) and the HRT-2 [ ] Beacons were subjected to a series of field tests during the period 8-9 March 1961. The program, in general, followed the outline set forth in attachments Nos. 1 & 2.

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2. Results were very satisfactory with respect to the HRT-2 performance and general handling characteristics. Useful homing ranges from 5 to 20 miles were achieved. The Helio aircraft Lear ADF receiver provided the longer range homing capability over the ARN-6 equipment utilized in the C-47. Under exactly similar conditions in the C-47 the HRT-1 was useful to a maximum range of 4 miles. From the point of view of ease of set up, operational reliability, portability, etc., the HRT-1 was only marginally useful.

**II. RESULTS:**

1. The Helio explored useful signal regions from 300 feet to 2000 feet altitude and from zero miles to 30 miles range. The C-47 was used from 500 feet to 2000 feet over ranges of zero to 10 miles. The HRT-2 was good up to 20 miles in the Helio and 8 miles in the C-47. The HRT-1 was tested only with the C-47 since we were unable to put it in operating condition during the Helio missions. Results were generally poor. Useful ranges varied from 3 to 4 miles depending on aircraft altitude and position

2. The HRT-2 Model #1 performed satisfactorily throughout the two day test program. Unit #2 developed a malfunction while operating in a heavy rain on the first day. Exact cause was not determined since the unit again performed satisfactorily when turned on the following day.

3. The HRT-1 performed in a generally unsatisfactory manner. Details follow:

- a. The antenna was improperly fabricated - several threaded fittings would not mate and had to be machined out before they would mate.
- b. The guy wire stakes bent while being inserted in soft, wet earth.

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- c. Three out of three tubes in the transmitter were inoperative and had to be replaced; shorted elements in each tube was the cause.
- d. A high voltage lead (blue) to the output tank circuit had been cut thru by a sharp chassis edge and was shorting to ground. No provision had been made for protection of this lead.
- e. Generally poor solder joints had to be checked over and re-made where appropriate.
- f. The power supply (battery box) is unnecessarily complex to load properly. Markings are inadequate and contacts poor.

### III. RECOMMENDATIONS:

#### 1. HRT-1:

- a. It is imperative that all subsequent units be subjected to a rigorous acceptance test at the Warehouse prior to release to the field; this to put particular emphasis on the shortcomings outlined above.
- b. The HRT-1 should not be issued operationally except as a last resort measure, and, in any case, not if a BN-2 or other more satisfactory Beacon is available. (such as the HRT-2). Training and Logistics support should be directed accordingly.
- c. No further procurement of the HRT-1 is necessary since the 40 already on order should more than cover needs for the next 6 to 8 weeks; at which time BN-2 Beacons will become available.
- d. An operational handbook c/w drawings and photographs should be prepared for the HRT-1. It would seem that this can best be done by TSD personnel since the Contractor has no experience in this area.

#### 2. HRT-2:

- a. Initiate action  leading towards a final pre-production prototype.
- b. Modify present design to incorporate separate power supply box; waterproofed and ruggedized beacon design;

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tone "beeper" in lieu of CW timer/interrupter; operation at 20 watts output power level; concealed neon bulb loading indicator; and alternative antenna in form of 1/4 wave horizontal wire (150' long) with appropriate loading circuit.

- c. It would appear as if a battery operated RF pre amplified to operate ahead of the aircraft ADF would be useful if atmospheric noise is not already the limiting factor. This will be investigated by the Contractor.

  
TSD/Systems Branch

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**Distribution:****Orig - TSD/AOB w/attach.**

-  1 - MH w/attach.  
→ 1 - S-7.7.4/1 w/attach  
1 - S-7.7.4/2 w/attach  
1 - Chrono

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**SECRET****ATTACH #1****BEACON TEST PROGRAM****1. Objective: (HRT-2)**

- a. To evaluate the performance of the HRT-2 MF homing beacon in a simulated operational environment.
- b. To check its performance characteristics including range at altitudes from 500 to 2500 feet; station passage accuracy over the same altitude spread; azimuthal accuracy from overhead to maximum range; ease of set up, tuning and adjustment, and take down; and reliability.
- c. To familiarize AOB observers with its operational characteristics on the ground and in the air.
- d. To compare its performance characteristics with the HRT-1 (Wesponder) and to evaluate its performance using, if possible, the HRT-1 antenna.
- e. To evaluate the use of infra-red techniques under non-contact flying conditions as a means for final drop zone identification.

**2. Procedures:**

- a. Practice set-up, tuning and adjustment on the HRT-1 and 2 beacons in daylight and dark operating conditions.
- b. Set up and operate HRT-2 beacon and proceed according to attached flight plan so as to test its performance characteristics.
- c. Ditto with respect to the HRT-1
- d. Interchange antenna on the two beacons and repeat flight plan.
- e. After dark set up simulated drop mission using HRT-2 and infra-red equipment for final contact. If possible, drop dummy cargo bundles without visual contact with drop zone.
- f. Where possible, while one of the beacons is under test the ground party should become familiar with the set up and operation of the other beacon.
- g. Note performance of each battery supply, particularly with respect to operating life.

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- h. Determine utility of beacon timer and Beeper with and without aircraft receiver BFO.

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ATTACH. #2

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FLIGHT PLAN

1. Set up and turn on beacon at air strip Drop zone.
2. Tune up and check out aircraft ADF receiver and air to ground voice link.
3. Take off and climb to 1,000 feet and proceed to one mile from DZ on heading of 360° - check proper operation of beacon and voice link.
4. Holding 1,000 feet, proceed away from DZ on heading of 360° to maximum range - determine max range for useable ADF signal and for audible headset indication, with BFO operating and non-operating.
5. Holding 1,000 feet initiate 180° turn and proceed towards DZ using ADF for homing - note signal strength, quality and operation of beacon timer and beeper.
6. Upon arrival over station - note signal buildup and needle reversal on station passage and check accuracy of station passage.
7. Continue away from DZ on heading of 180° to maximum range -- repeat step 4 measurements.
8. Holding 1000 feet initiate 180° turn and proceed towards DZ using ADF for homing -- repeat steps 5 and 6 measurements.
9. Depart DZ on heading of 90° and climb out to 2500 feet to maximum range - repeat step 4 measurements.
10. Holding 2500 feet initiate 180° turn and proceed towards DZ using ADF for homing -- repeat steps 5 and 6 measurements.
11. Depart DZ on heading of 270° and descend to 500 feet altitude to maximum range -- repeat step 4 measurements.
12. Holding 500 feet initiate 180° turn and proceed towards DZ using ADF for homing - repeat steps 5 and 6 measurements.
13. Repeat 1 through 12 using second beacon
14. Repeat step 4 with both beacons on the air -- note any differences in range, signal quality, etc.

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ATTACH #2 Cont'd

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For Night Time Operation:

1. Repeat steps 1 through 5
2. Upon arrival in vicinity of station use infra-red equipment for final contact -- note station passage accuracy, and useful range of infra-red source and viewer.
3. Set up beacon in secondary DZ - location unknown to aircrew - and repeat steps 1 and 2 above.

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